SAVING LIVES
CHANGING LIVES

Overview of Mobile Storage Units

Alternate Mechanisms for Grain Storage

WFP
World Food Programme

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Overview of Mobile Storage Units

One of the emerging areas of concern by both the Government and farmers has been the limited availability of covered space for storage of food grains across the country. The situation is further aggravated by the year-on-year accumulation of surplus grains under the Central Pool and during the harvesting seasons of Rabi and Kharif.[1]

In order to compensate for the lack of adequate[2] storage, farmers, procurement agencies and States, therefore have to rely on Open storage or Cover and Plinth storage (CAP) techniques.[3] When using Open or CAP storage, there is much higher risk of losses due to the climatic conditions (rain, heat, and snow) as well as pest and rodent infestations which renders grains unfit for human consumption. However, the greatest impact is on the farmers, as it leads to large post-harvest losses, resulting in reduced income.

To address this challenge, the World Food Programme (WFP) India has been exploring possibilities for increasing storage capacities for state Governments, leveraging its experience as the world's largest humanitarian organization and the lead on logistics and supply chain for the UN system. One such solution is through the use of Mobile Storage Units (MSU) which are used by WFP worldwide as temporary warehouses for the food which WFP procures and distributes to vulnerable food insecure households across the globe.

An MSU is akin to a scientific warehouse that can be erected within 2-3 days on flat, hard earth or on a raised elevation. It is 24 meters x 10 meters x 5.5 meters in dimension and has a storage capacity of nearly 450 metric tonnes. It is constructed of a material that is waterproof but at the same time allows ventilation (See Annexure I for details).

Additionally, there are other options available as well such as permanent pre-fabricated structures and semi-permanent storage structures like Flospan, with their own advantages and disadvantages. The comparison of all three structures is provided in Annexure II.

Figure 1: (left) Cover and Plinth Storage; (Right): Open Storage

Figure 2: WFP's Mobile Storage Unit

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Piloting Mobile Storage Units

As a first step, WFP is working with the Governments of Uttarakhand and Odisha to pilot these mobile storage units. 2 of these units will be imported from the United Nations Humanitarian Response Depot (UNHRD)[4], while the remaining 2 , will be sourced from local India manufactures; and deployed in 2 locations in Odisha and 2 locations in Uttarakhand.

The aim of the pilot is to:

1. To demonstrate the MSU as an alternate mechanism for storage of food grains in lieu of CAP or Open storage.
2. Quantify the reduction in post-harvest losses - especially storage losses.
3. Demonstrate the cost-benefit analysis of utilizing and scaling up MSU usage.
4. Determine the utility of MSUs in hilly and difficult areas for pre-positioning of stocks to ensure all year availability of TPDS entitlements.
5. Share global best practices in warehouse management and increase the technical capacity of the warehouse managers for using MSUs.

The state of Uttarakhand is a hilly state with nearly 90 percent is mountainous terrain and more than 60 percent of the area covered with forests. Difficult terrain, limited availability of transporters, limited windows for transportation and the disintegrated storage spaces (due to limited availability of land and planning) across the state have led to the state government incurring very high costs for transportation of TPDS commodities. During monsoon and winter seasons some high-altitude areas get cut off from the main supply hubs, thereby reducing the access to and availability of food grains.

The state operates a 3-tier system for storage of food grains. The grains from FCI and state pool are stored in Base warehouses (1) from where they are transported to Field or Interior warehouses (2), which then deliver to the FPS (3). A mission undertaken by WFP experts in December 2019, observed that the interior warehouses had very small storage capacity and lacked the basic facilities for preserving the food grains. In addition, erratic weather conditions result in high storage losses and often hamper the availability of food grains. To address the above challenges, WFP shall pilot the use of Mobile Storage Units (MSU) at two locations in the state in close collaboration with the Department of Food and Civil Supplies, Government of Uttarakhand.

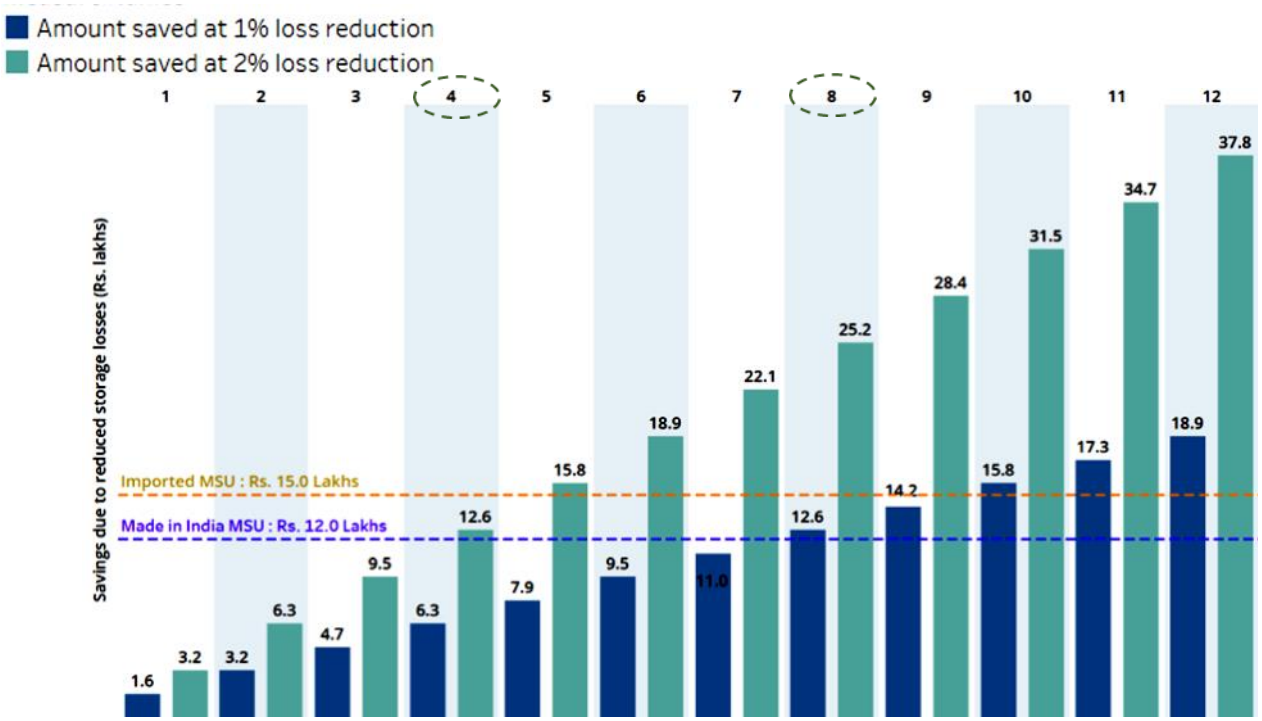


Figure 3: Cost benefit analysis of MSU

Odisha is a decentralised procurement state and procures nearly 6 million MTs of paddy each year from the farmers. Under this system, paddy is procured from farmers at MSP, sent to the mills for processing and the milled rice is then transported to the Fair Price Shops through the state warehouses. The need to store paddy/rice at all these places in the supply chain needs additional storage space. Additionally, any delay in the procurement or movement of the paddy and untimely rains, lead to degradation of the food grains thereby impacting the livelihoods of the farmers and the availability of grains for the state.

To demonstrate the ability of providing a flexible covered storage space that can be used and deployed as per the need of the department, WFP in close collaboration with the Food Supplies & Consumer Welfare Department, Government of Odisha, shall deploy 2 MSUs. These MSUs will be used as transactional warehouses to store food grains or pulses before being transported to the FPS.

For the farmers, availability of such a storage space allows them to store their grains and sell them in the market when the prices are favorable without any degradation in quality.

Cost Benefit Analysis

The post-harvest losses for paddy and wheat range from 4.65 to 5.99 percent. As shown in the illustration below, the break-even[5] of the cost of a Mobile Storage Unit at 1% of reduction of storage loss will be in the 8th month of deployment whereas at a rate of 2% it will be in the 4th month. As losses are heavily dependent on the duration of storage and temperature, it is anticipated that the 2% reduction would be mostly in the norther areas especially during summer, while the 1% would be in areas that have higher humidity and lower temperatures.

Sustainability and Scale-up

To ensure sustainability , WFP will procure 2 from local manufactures in India. WFP has already identified a few vendors in India that would be able to provide locally manufactured MSUs, which are anticipated to be around 30-35% cheaper than the imported MSU. Based on the learnings from the pilot, this concept can then be scaled up across the country, based on the conditions and requirements. These locally manufactured MSUs, would be more cost-effective, sustainable and can also be exported for use by international agencies such as WFP, UNHCR and Norwegian Refugee Council.

References

[1] *Central pool is the food grains procured by agencies of GOI like FCI from the farmers at Minimum Support Price (MSP) and is used for distribution under the various food-based safety nets and also for maintaining buffers.*

[2] *Rabi crops sown around November and harvested around April/May*

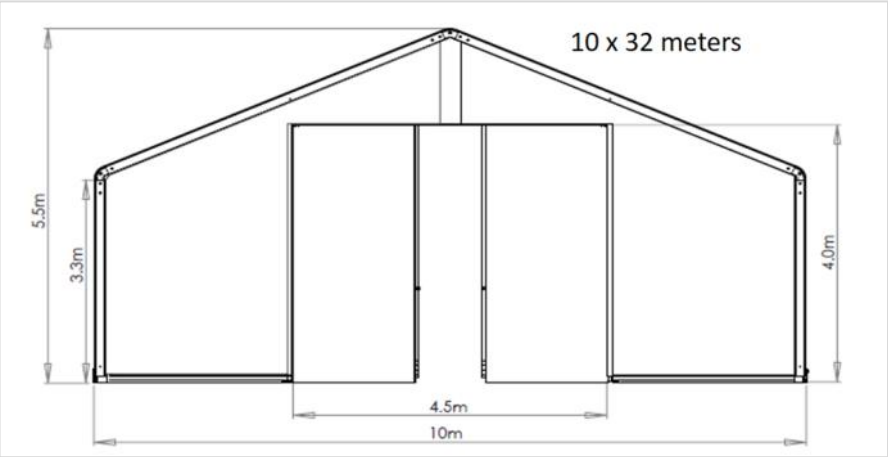
[3] *Kharif crops in India are sown around June and harvested in October*

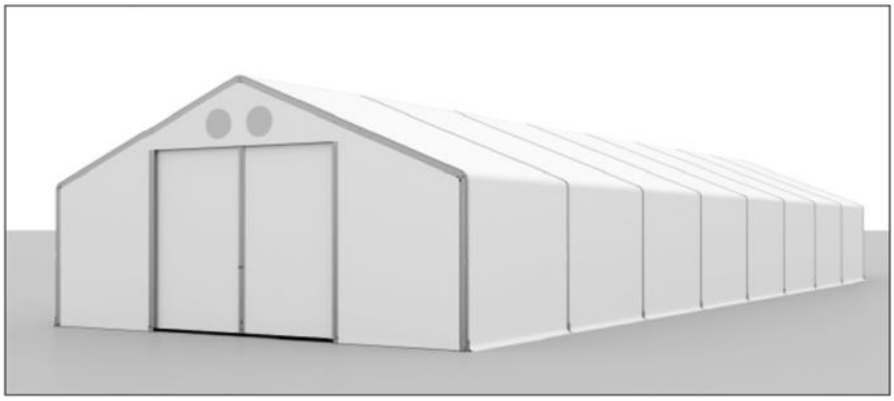
[4] *UNHRD is managed by WFP and was setup to act as a robust logistics platform, available to all partners as a "shared resource for all partners. The mandate to provide rapid and accessible stockpiling and demobilisation services to partners inside and outside the United Nations. There are 6 HRD hubs , one each in Accra, Brindisi, Dubai, Kuala Lumpur, Las Palmas and Panama.*

[5] *Study report of Central Institute of Post-Harvest Engineering and Technology (CIPHET), an Institute under the Indian Council of Agricultural Research (ICAR), based on survey conducted during the year 2013-14, the annual harvest and post-harvest losses of major food grains ranges from 4.65 to 5.99%*

Annexure I: Specifications of MSU

Structure: Aluminum structure
Covering: PVC coated polyester with UV protection
Ventilation: 2 air vents in each gable
Wind Load Capacity: up to 110 km/Hr. when attached to the ground as per instructions
Snow load Capacity: up to 75 kg/ m^2 when attached to the ground as per instructions





Annexure II : Comparison of various alternative storage structures

	Prefabricated Flospan- Frameless Steel Structure	Mobile Storage Unit (MSU)	Pre-engineered Steel Portal-Framed Structure
			
PROS	• Easy and quick to install. • Optional insulation available. • Very little manpower required. • Long lifespan. • Higher structural strength than MSU	• Easy and quick to install. • Optional insulation available. • Very little manpower required. • Most cost-effective.	• Dimensions can be chosen as per requirements. • Suited to Bespoke design. • Strong and durable construction. • Long Lifespan.
CONS	• Limited in terms of maximum height. • Needs reinforced concrete slab • More expensive than MS	• Limited in terms of maximum size. • Shorter lifespan. • Not cyclone proof	• Lengthy construction time. • Labour intensive. • Most expensive

Comparison of detailed specifications			
	Prefabricated Flospan-Frameless Steel Structure	**Mobile Storage Unit (MSU)**	**Pre-engineered Steel Portal-Framed Structure**
Dimensions	• 10 x 24 m, or greater • 4.8 m apex height (sides reduce to a min. height of 2.8 m) • Smaller option- 7.5 x 20.1 m	• Generally, 10 x 24 m or up to 10 x 32 m	• Dimensions can be chosen as per requirements, spanning from 10 x 20 to 40 x 150 for example
Materials	• Galvatite cladding material • Hot rolled mild steel base framework and door frames • Galvanised steel doors and windows	• Made of durable aluminium box profiles and hot-dipped galvanised hardware, with covers of durable fire retardant and UV-resistant translucent PVC fabric. • Can be used in both hot & cold climates	• Portal frames with columns and rafters, rafter bracing and side bracing. Gable posts both ends and eaves beams, door and window frames.
Installation	3 days	3 days	2 to 5 months erection timeframe
Set Up	• Installation on the ground is an option (if soil allows so), but reinforced concrete slab would be recommended	• Provided: Adjustable base plates, Spike Puller for installation on the ground. • Reinforced concrete slab would be recommended	• Reinforced concrete slab and foundation are mandatory required.
Labour Requirements	2-3 personnel	3-4 personnel	10-20 personnel, a construction contractor shall be used
Tools & Machinery Requirements	• No need for lifting equipment, no working at heights. • Assembled by hand. • Tools required	• No need for lifting equipment, no working at heights. • Assembled by hand. • Tools required	• Crane is required. • Tools required.
Optional Extras	• Rooflights • Ridge vents • Gable vents • Insulation • Windows • Prefab foundations/ floor • Ground spikes • Mechanical ventilation system, • electrical/ wiring system, 3kW PV system	• Flexible Internal Partitioning • Insulation Liner system • Pedestrian door • Roll-up side door & lining kit • Solid Floor system • Solar Energy system • Fire alarm • Heating system • Lighting kit	Anything can be designed, since this is a fit-for-purpose warehouse, designed to fit specific requirements, for example: • lighting, AC systems, internal temperatures, • openings, ventilation, elevation from the ground, raised platforms, • loading/unloading platforms, etc
Lifespan	20+ years with regular maintenance	3 to 5 years recommended	40+ years with regular maintenance
Construction cost estimates	• USD 25,000 (for a 500 m^2 WH) excluding civil works and optional extras.	• USD 15,000 (for a 10 x 24 m MSU) excluding civil works and optional extras	• From USD 230,000 (for a 200 m^2 WH) to USD 800,000 for a 6000 m^2 WH). Civil works included.

Cover illustration by: WFP/SanjnaSudan

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